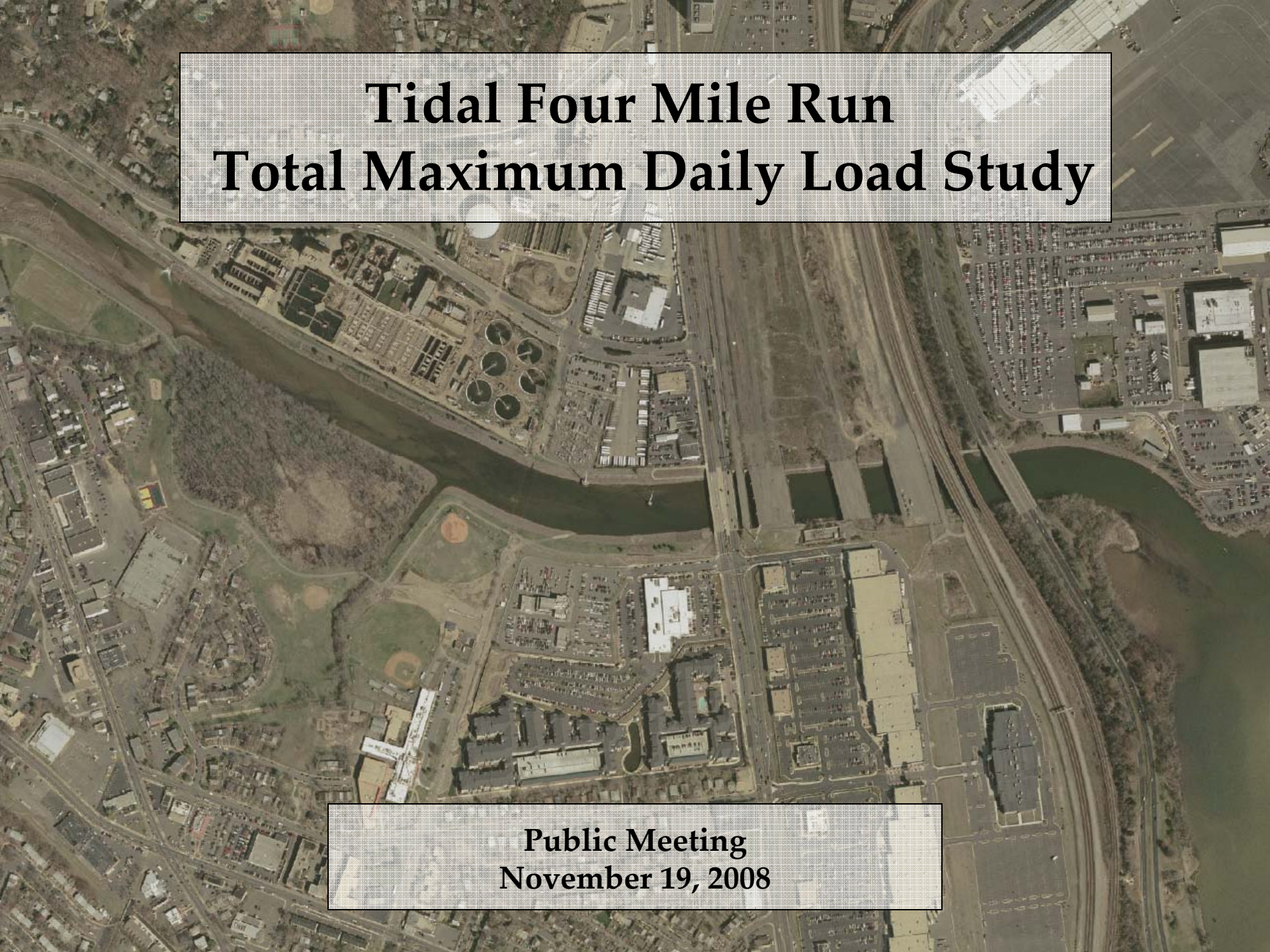


Tidal Four Mile Run
Total Maximum Daily Load Study

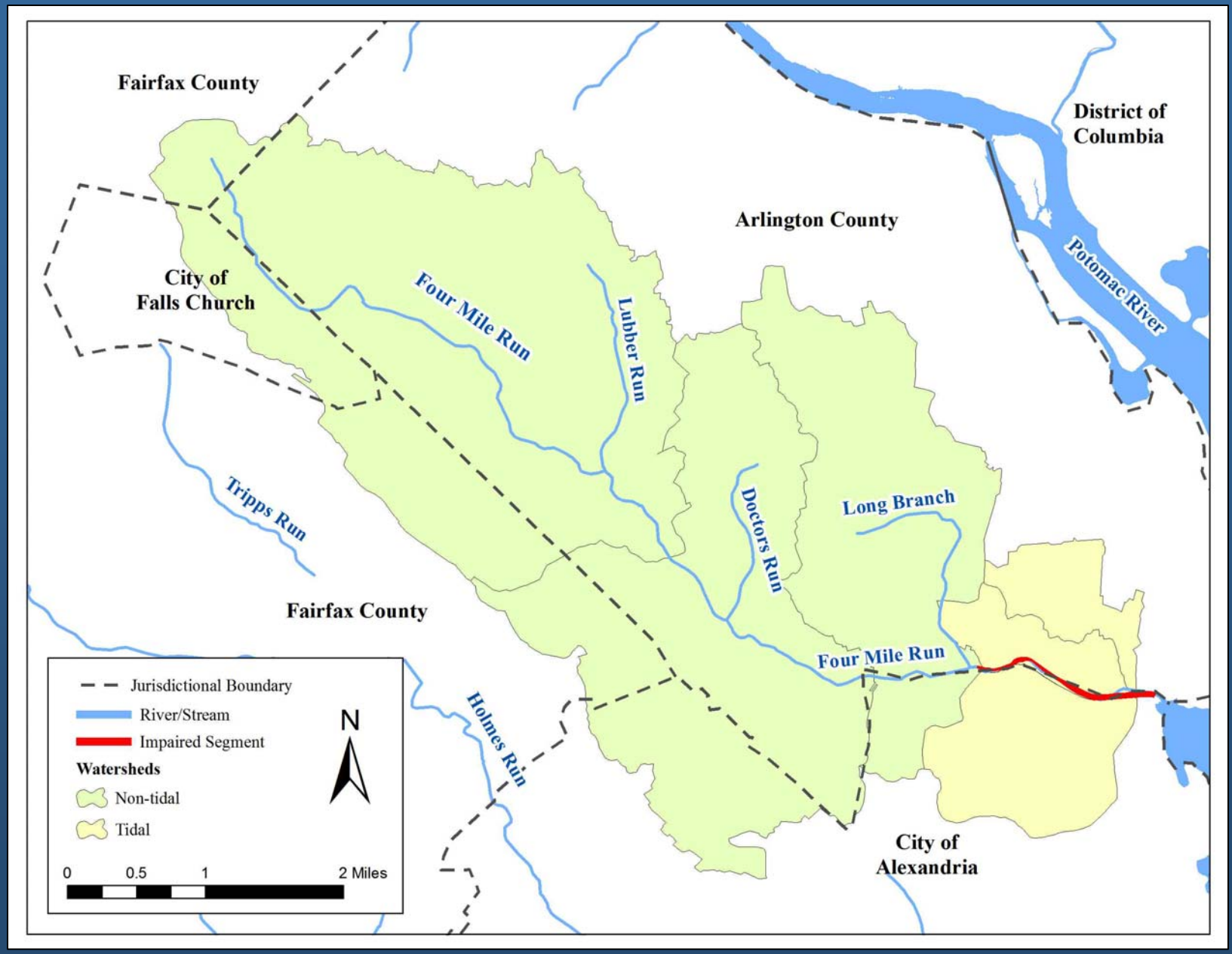
Public Meeting
November 19, 2008

Why are we here?

The tidal portion of Four Mile Run does not meet water quality standards.

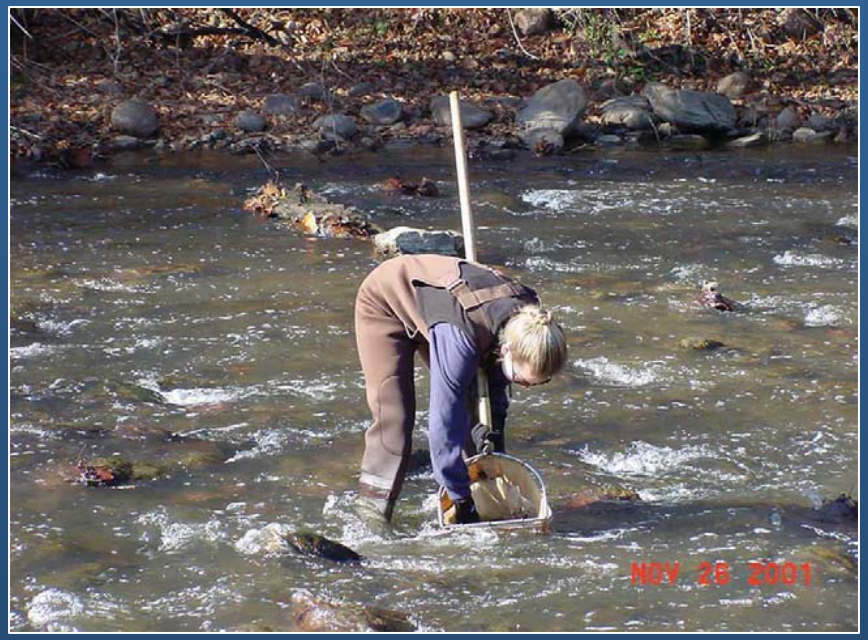
- Where is the Tidal Four Mile Run Watershed located?
- How do we know standards aren't being met?
- Why doesn't Tidal Four Mile Run meet standards?
- What is being done to correct the problem?

Location of Tidal Four Mile Run



How do we know if water bodies in Virginia are healthy?

- Perform physical and chemical monitoring on water bodies throughout the state.
- Monitor parameters such as:
  - pH
  - Temperature
  - Dissolved Oxygen
  - Biological Community
  - Bacteria
  - Nutrients
  - Fish Tissues
  - Metals/Toxic Pollutants



What does DEQ do with the monitoring data that is collected?

Compare the data collected to the water quality standards.

Water Quality Standards:

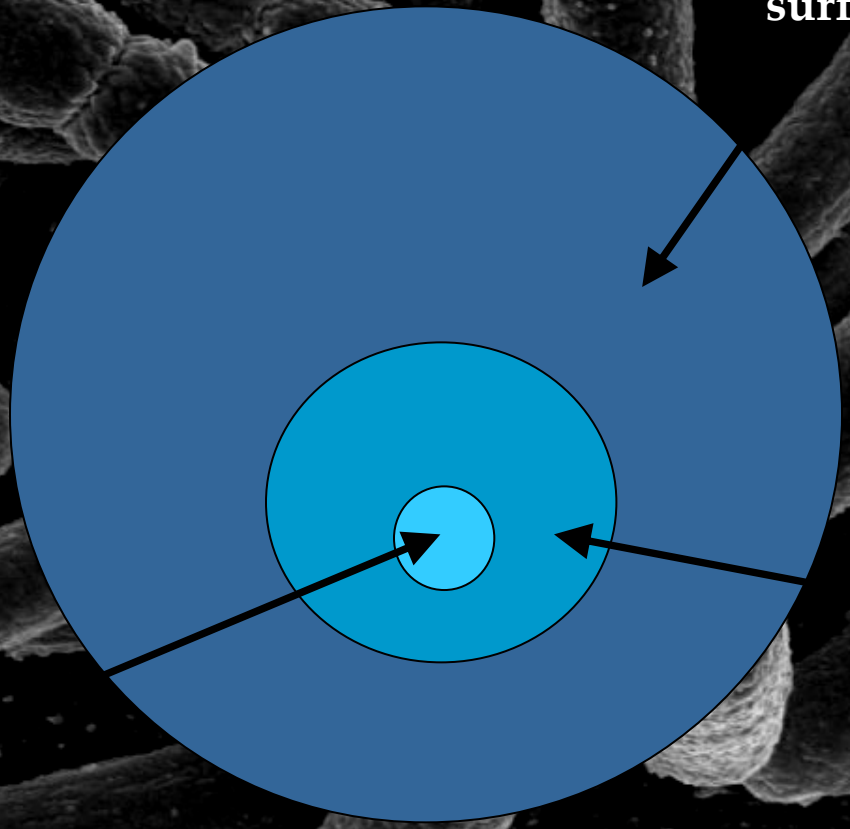
- Regulations based on federal and state law.
- Set numeric and narrative limits on pollutants.
- Consist of designated use(s) and water quality criteria to protect the designated uses.

Designated Uses

- Recreational
- Public Water Supply
- Wildlife
- Fish Consumption
- Shellfish
- Aquatic Life

Recreational Use Impairment
What are Fecal Coliform and *E. coli* Bacteria?

Coliform Bacteria:
Commonly found in soil, decaying vegetation, animal feces, and raw surface water



Fecal Coliform:
- Found in the digestive tract of humans and warm blooded animals
- Indicator of the potential presence of pathogens in water bodies

Escherichia coli:
- Subset of fecal coliform bacteria
- Correlate better with swimming associated illness

Potential Sources of Fecal Coliform Bacteria

What is the Water Quality Standard for Bacteria?

Indicator	Instantaneous (cfu/100mL)	Geometric Mean (cfu/100mL)
E. coli	235	126

- In order for a water body to be listed as impaired:
  - There must be at least two samples that exceed the water quality criterion.
  - Greater than 10.5% of the total samples must be exceedances.
- Geometric Mean criterion applies when there are two or more samples collected within a calendar month.

What happens when a water body doesn't meet water quality standards?

- Waterbody is listed as "impaired" and placed on the 303(d) list.
- Once a water body is listed as impaired, a Total Maximum Daily Load value must be developed for that impaired stream segment to address the designated use impairment.
- TMDL Studies are required by law:
  - 1972 Clean Water Act (CWA)
  - 1997 Water Quality Monitoring Information and Restoration Act (WQMIRA)

What is a TMDL ?

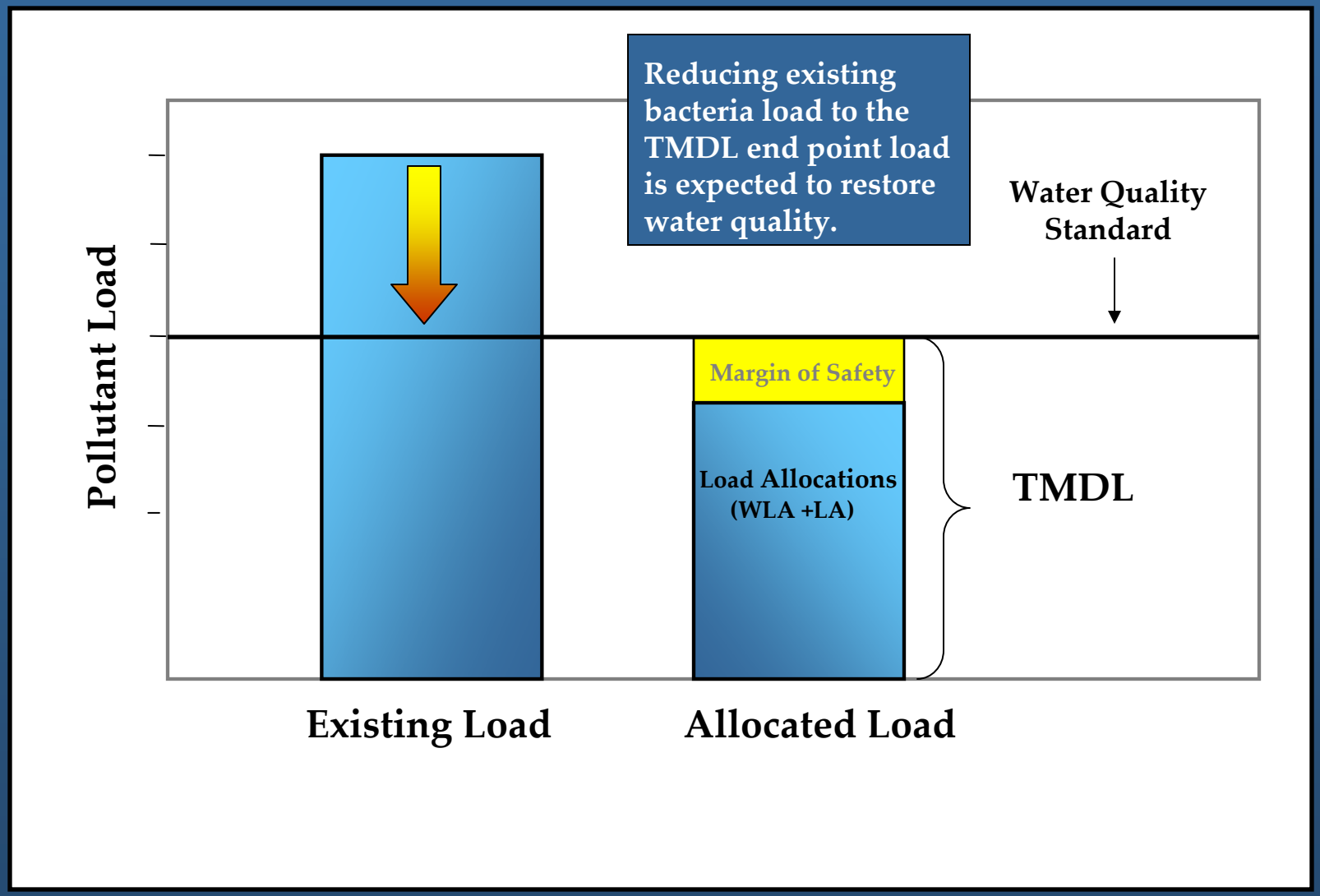
Total Maximum Daily Load

TMDL = Sum of WLA + Sum of LA + MOS

Where:

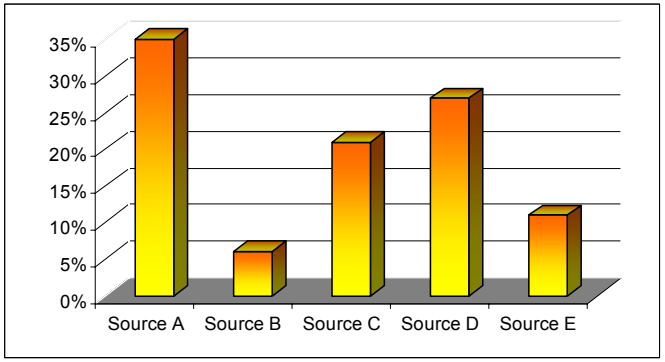
TMDL = Total Maximum Daily Load
WLA = Waste Load Allocation (point sources)
LA = Load Allocation (nonpoint sources)
MOS = Margin of Safety

An Example TMDL



We are here

TMDL Study

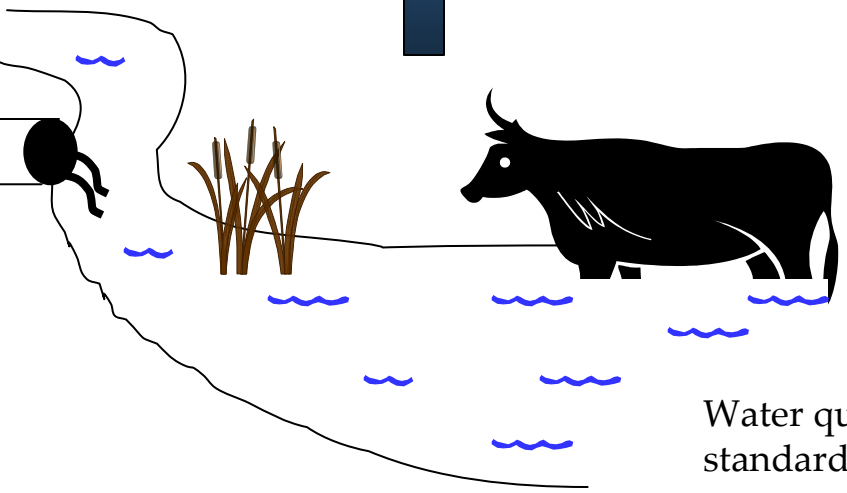


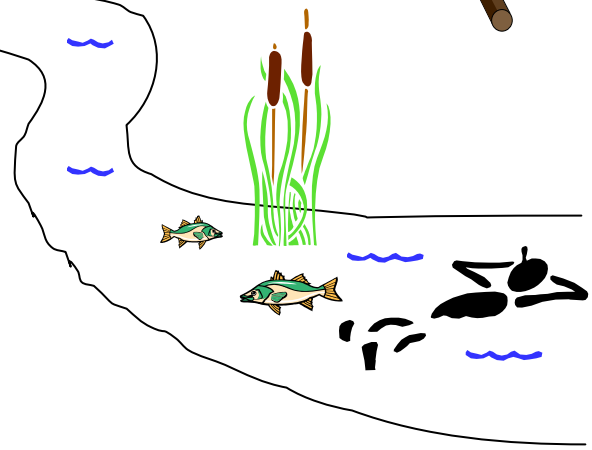
Implementation Plan

DCR

Implementation

Monitoring





Water quality standards not met

Questions?

Total Maximum Daily Load Development for Tidal Four Mile Run

TMDL Development Methodology

Step 1 - Data Collection and Watershed Assessment

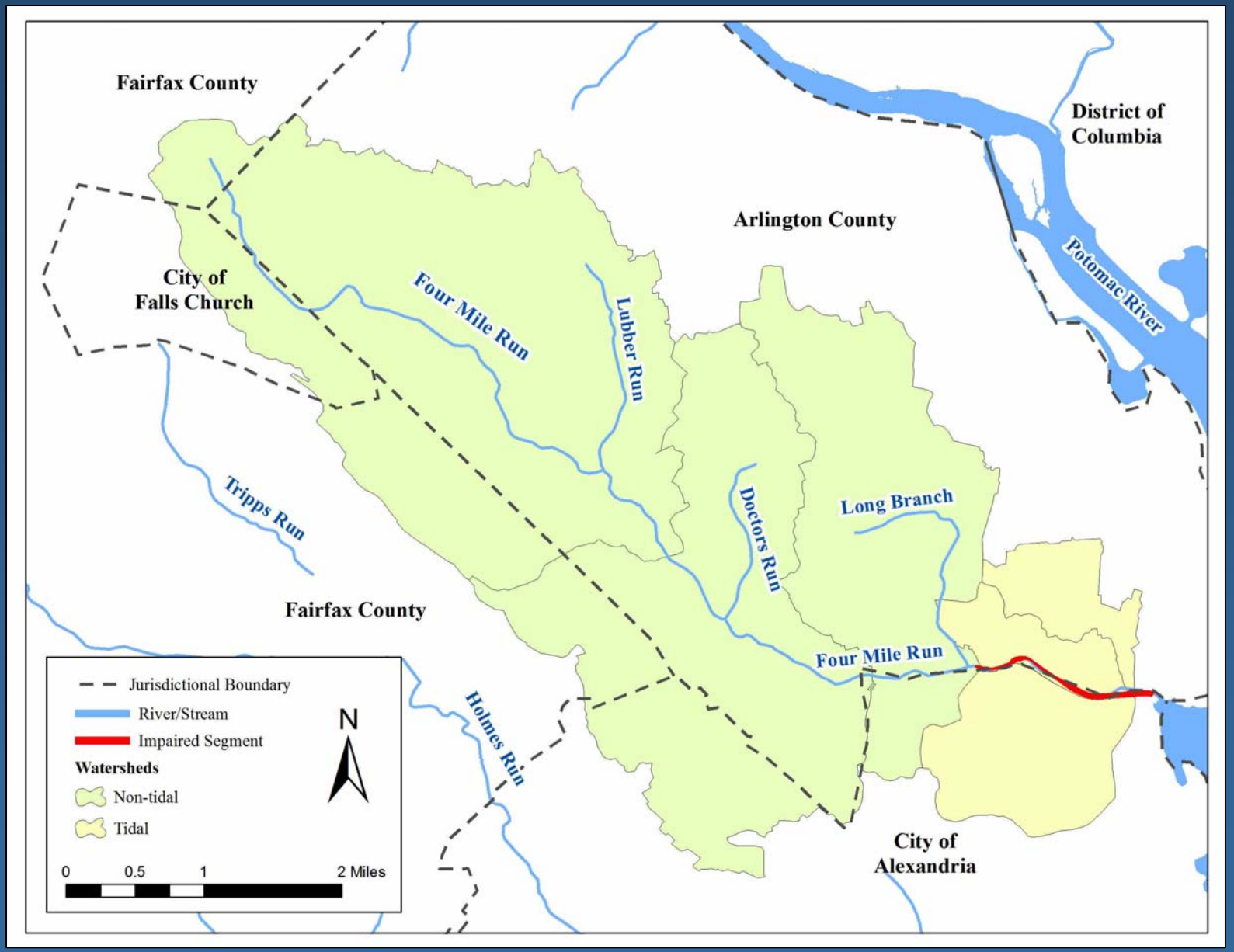
Step 2 - Source Assessment

Step 3 - Computer Modeling

Step 4 - Determine Required Reductions by Source

Step 1

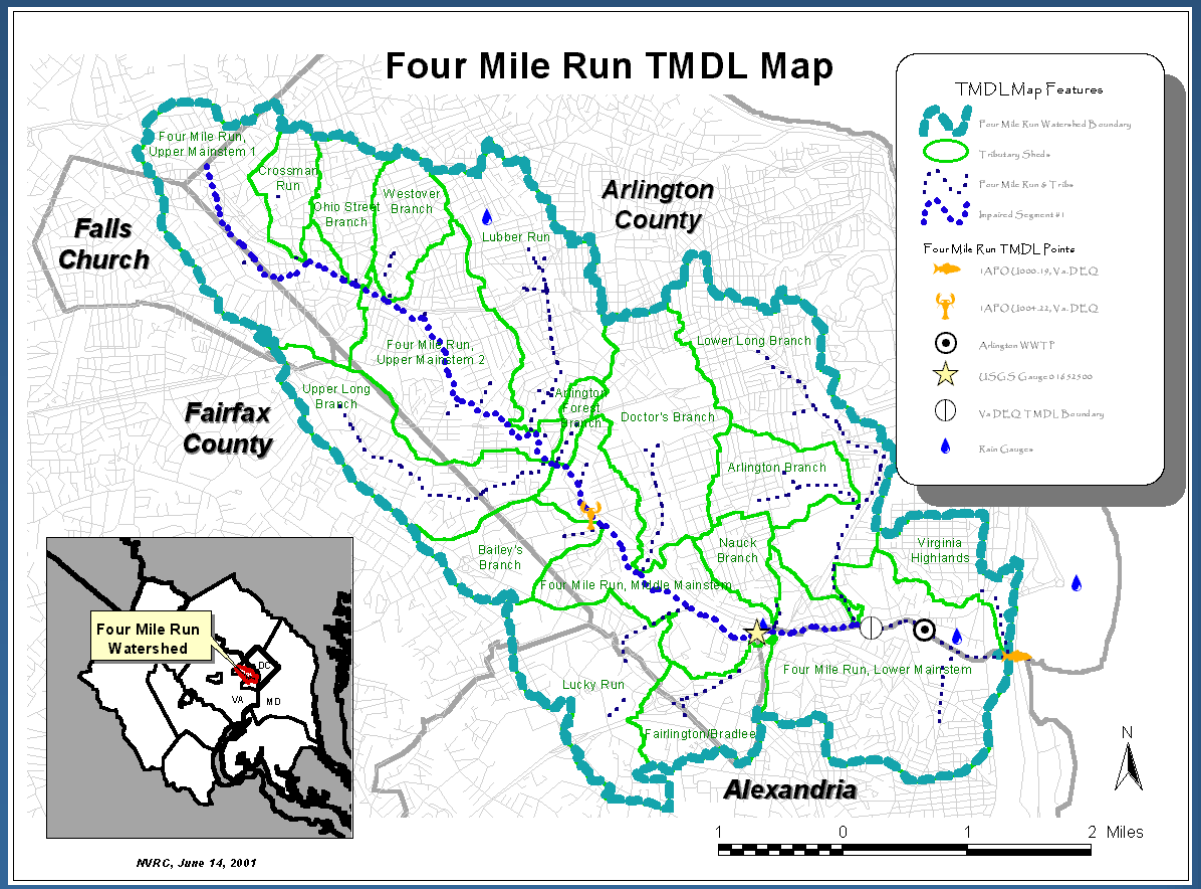
Data Collection and Watershed Assessment



The tidal portion of Four Mile Run is located in Arlington County and the City of Alexandria.

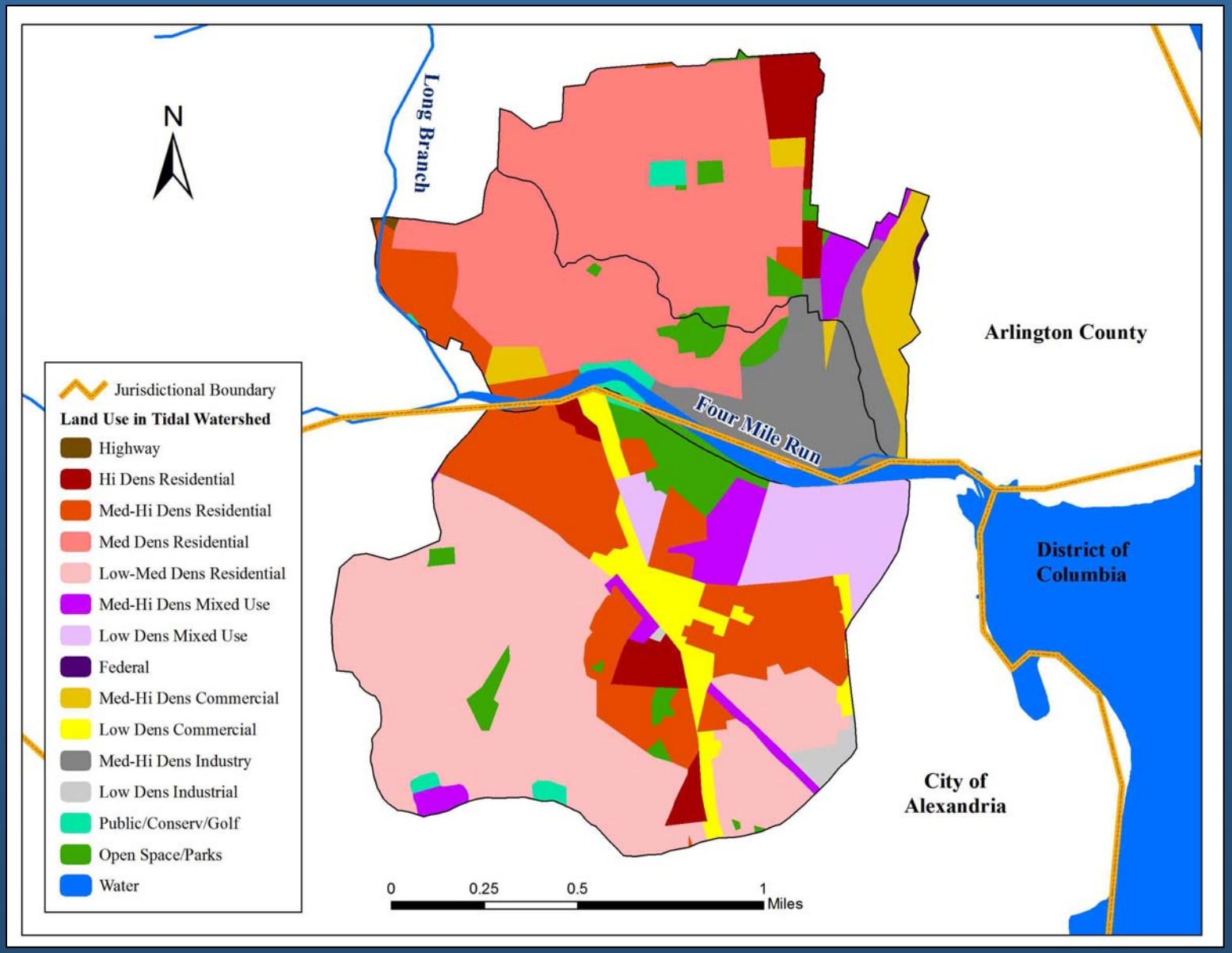
Completed Bacteria TMDL for the Non-Tidal Portion of Four Mile Run

- One of the first bacteria TMDLs in primarily urban watershed.
- Required Reductions
  - –95% from wildlife sources
  - –98% from pets
  - –98% from human sources
- Implementation Plan (NVRC, 2004) targets anthropogenic sources of bacteria—no direct controls on wildlife.



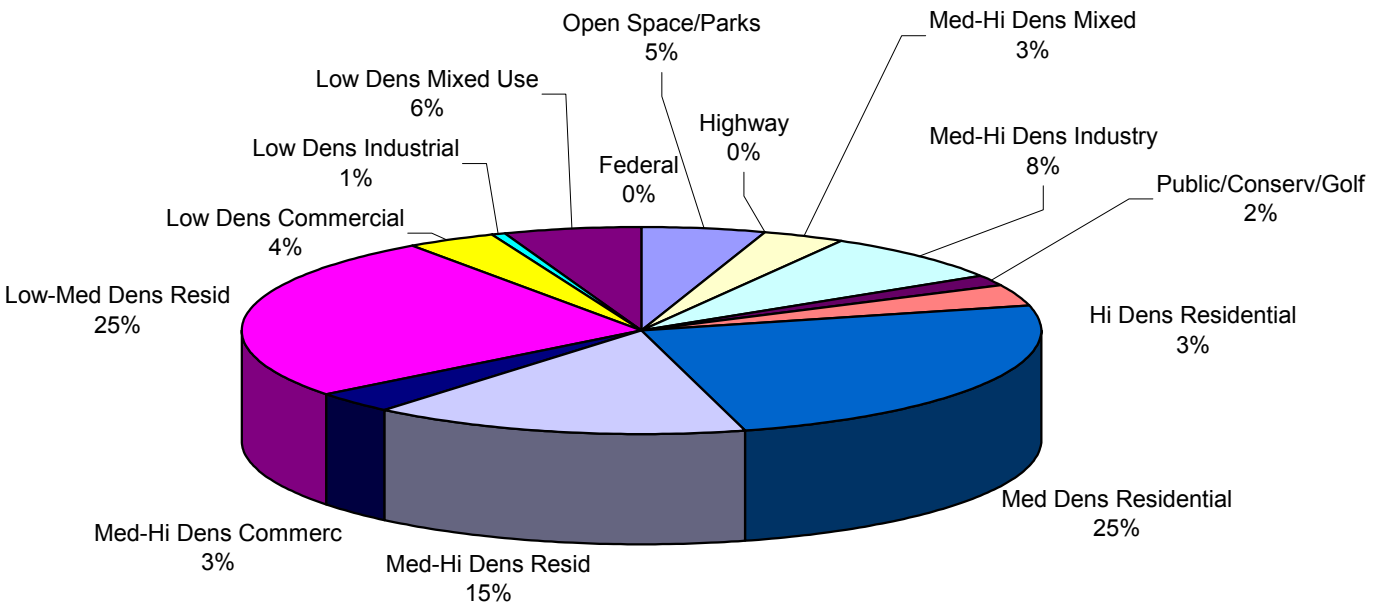
(Northern VA Regional Commission, 2002)

Land Use Tidal Four Mile Run Drainage

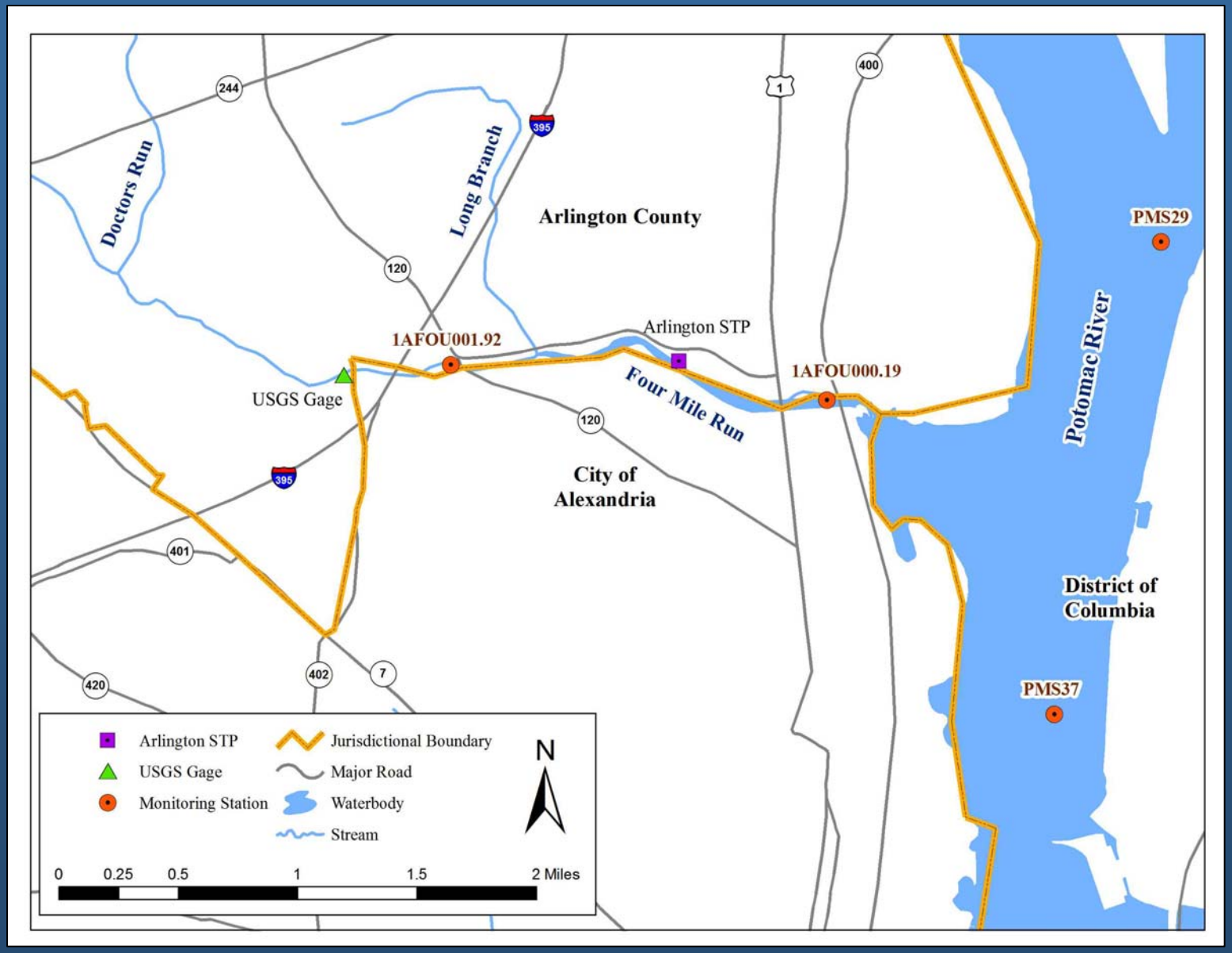


Taken from the Non-Tidal Bacteria TMDL for Four Mile Run, as prepared by the Northern Virginia Regional Commission.

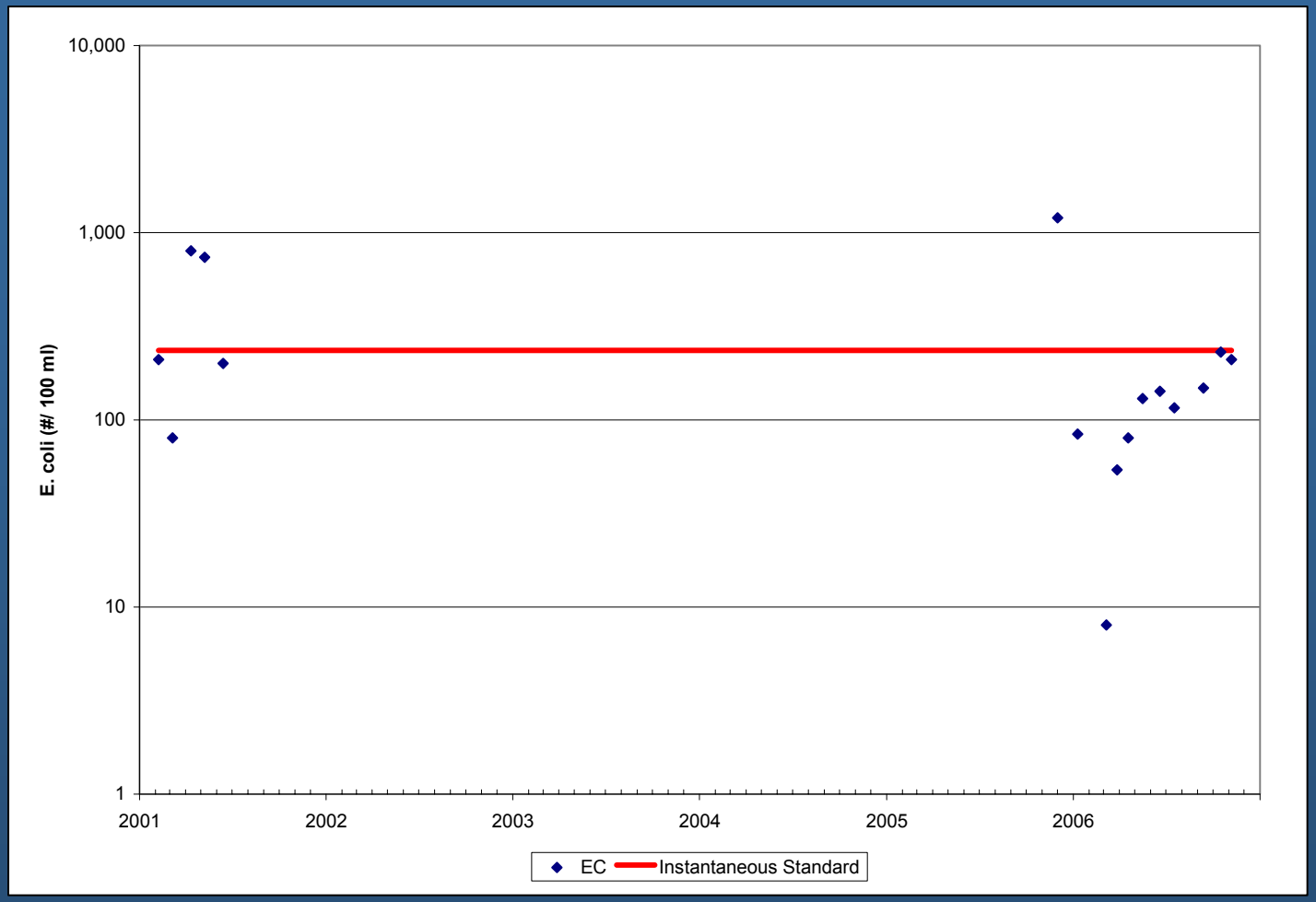
Land Use Distribution



Monitoring Station Locations

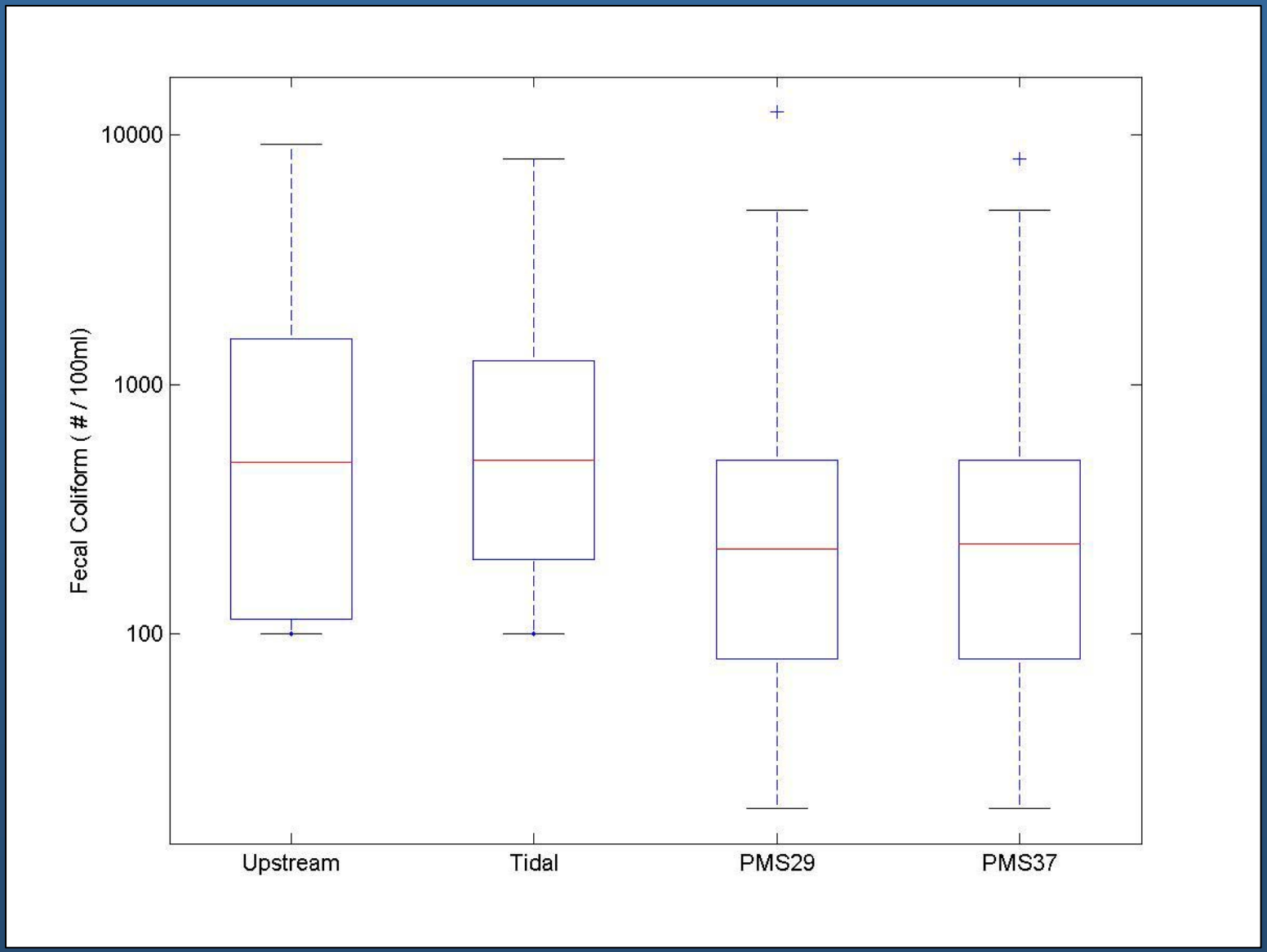


E. Coli Monitoring Data Tidal Four Mile Run



Station	2006 Assessment Exceedance Rate for *E. coli* Bacteria	2008 Assessment Exceedance Rate for *E. coli* Bacteria
1AFOU000.19 **GW Parkway**	**40%** **2 of 5 Samples**	**18%** **3 of 17 samples**

Comparison of Bacteria Concentrations at Monitoring Stations



Step 2

Source Assessment

Sources of Bacteria in Tidal Four Mile Run

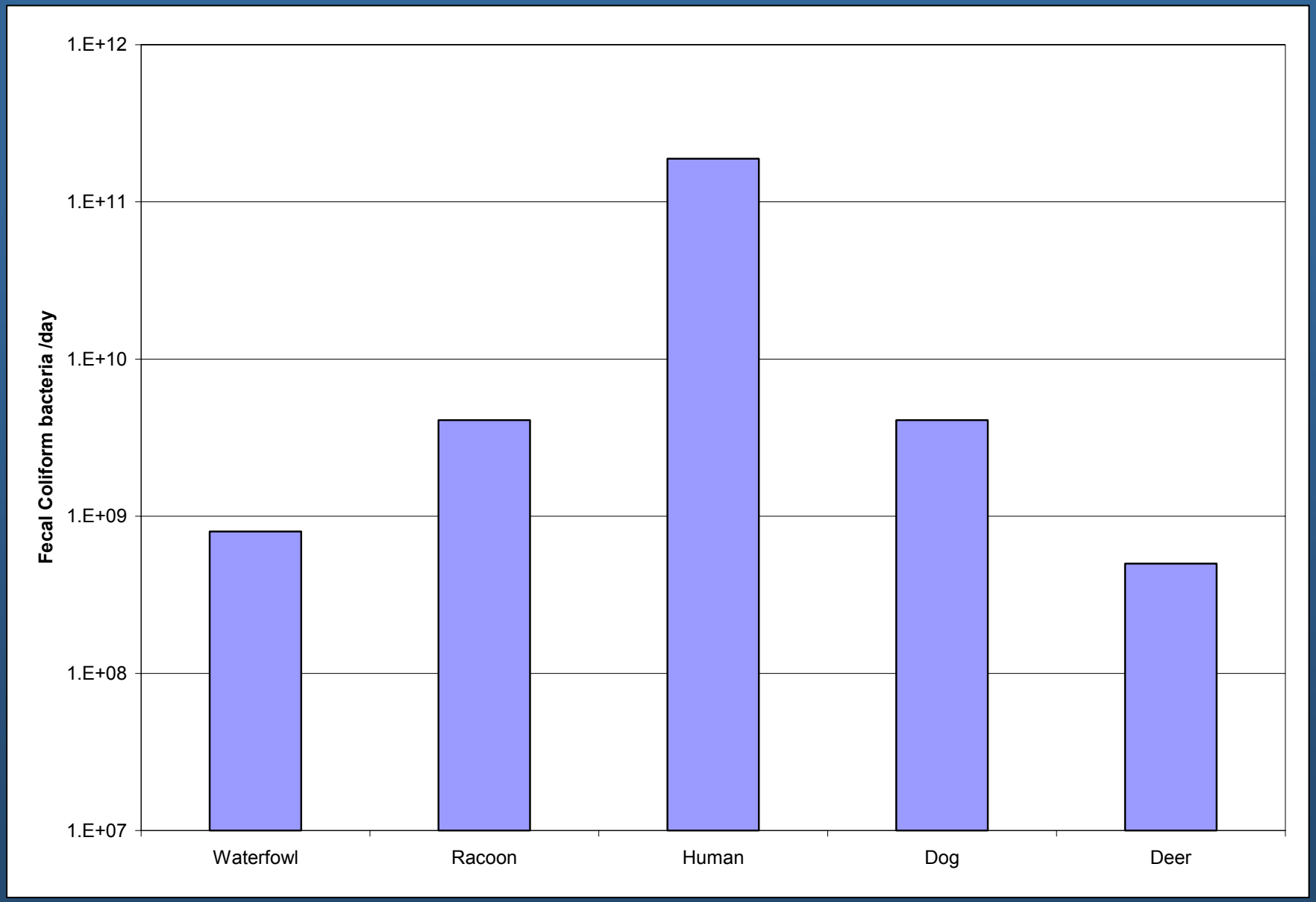
- Upstream Non-Tidal Four Mile Run
- Permitted Point Sources
- DC Boundary
- Drainage to Tidal Four Mile Run
  - Wildlife
  - Human
  - Pets
  - Other

Permitted Point Sources

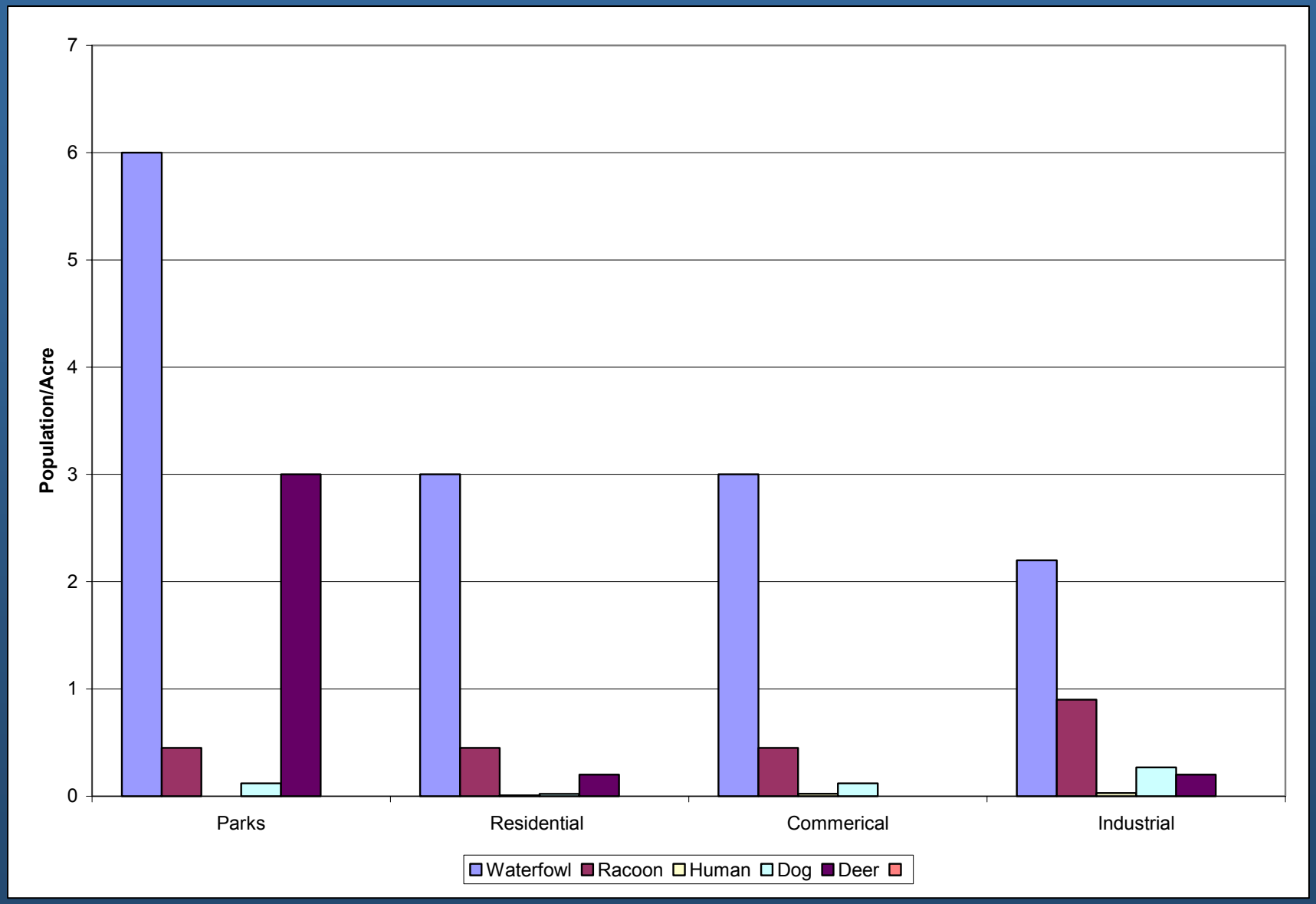
Waste Load Allocation (WLA)

- **Virginia Pollutant Discharge Elimination System (VPDES) Permits**
  - Arlington County Water Pollution Control Facility
- **Municipal Separate Storm Sewer System (MS4) Permits**
  - Arlington County
  - City of Alexandria
  - VDOT
  - George Washington Memorial Parkway

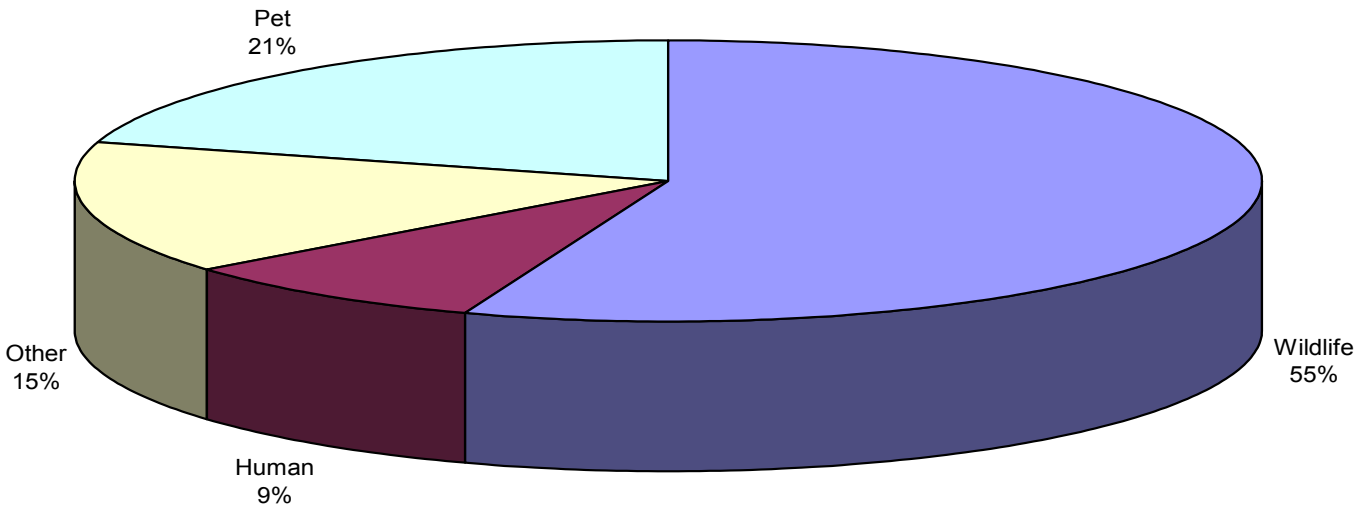
Fecal Bacteria Production Rates



Typical Population By Land Use



Bacteria Source Tracking (BST) Results Tidal Four Mile Run



Consistent with Non-tidal BST Results

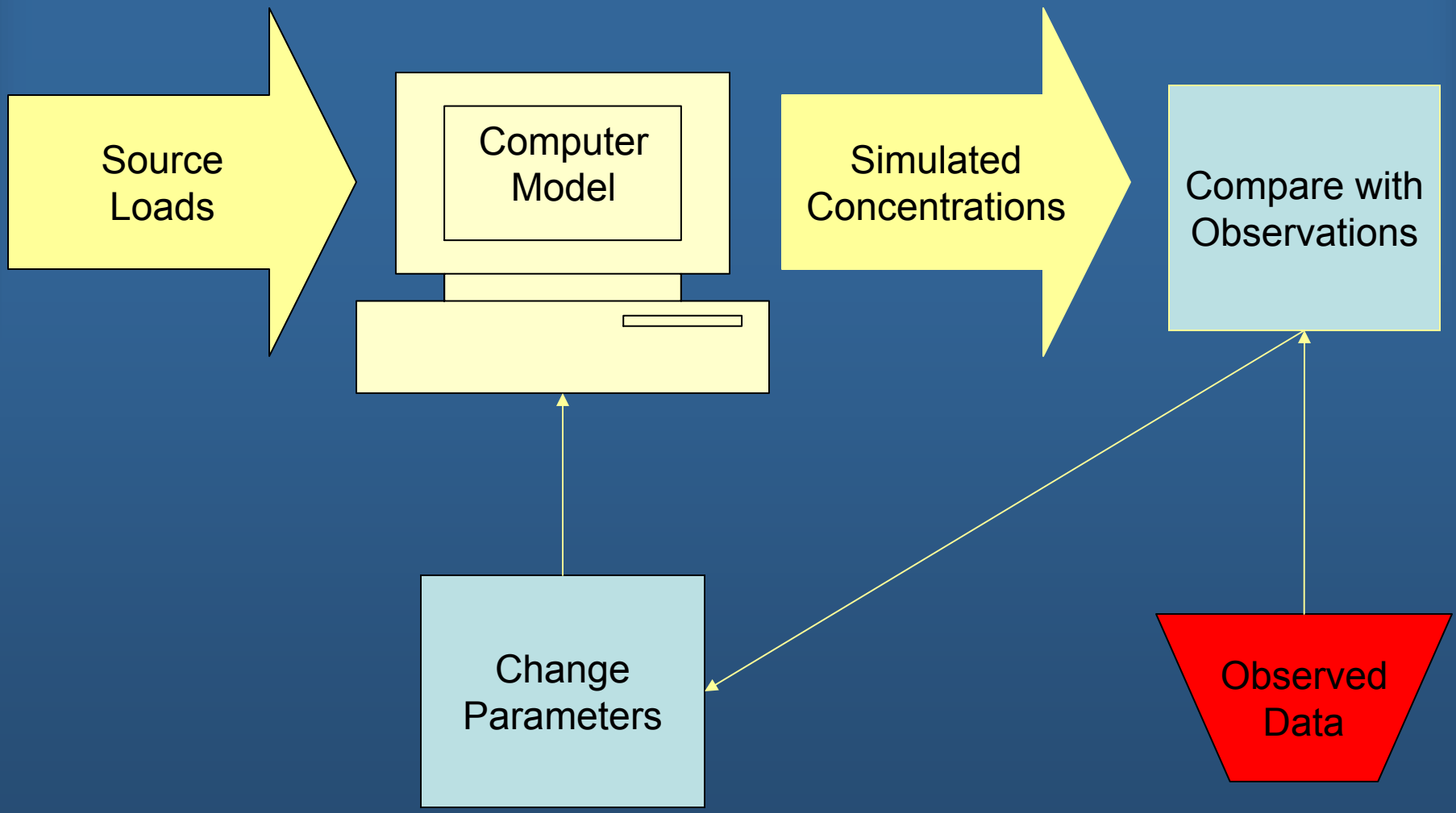
Step 3

Computer Modeling

Role of Computer Simulation Models in TMDL Development

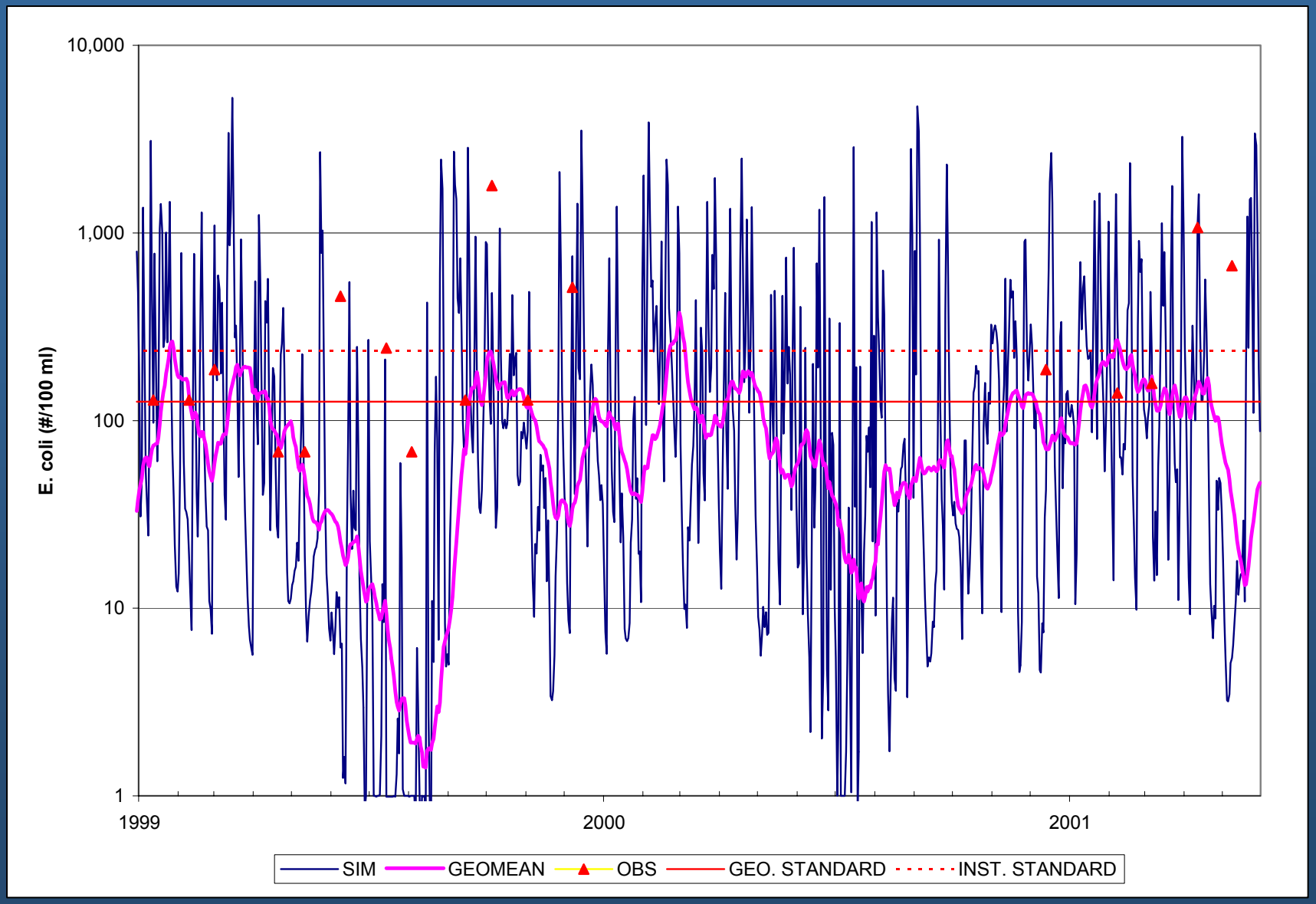
- Calibration: Determine "link" between source loads and bacteria observed in waterbody (decay rates and mixing rates)
- TMDL Scenario: Determine source load allocations consistent with water quality standards

Calibration

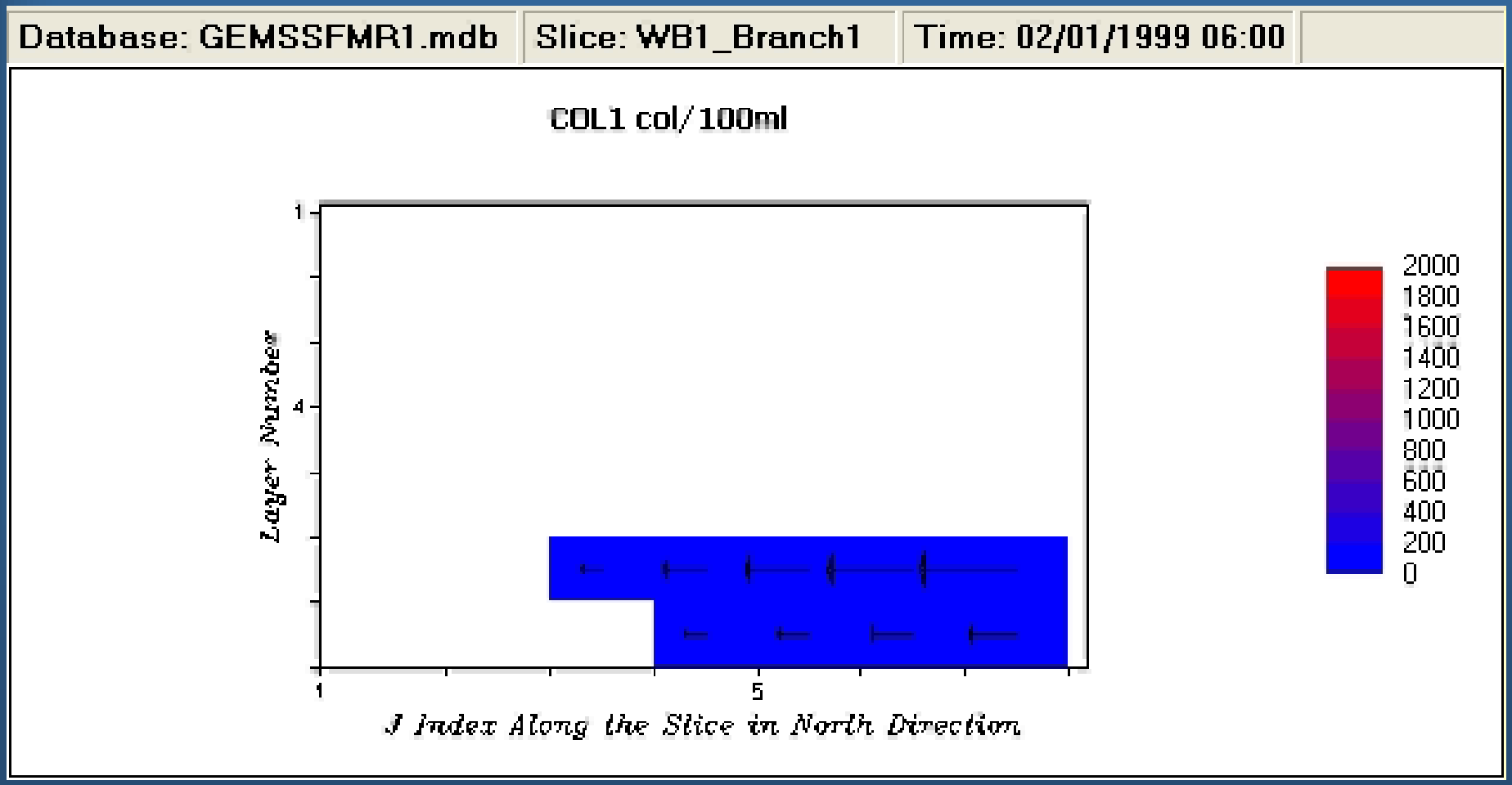


Observed and Simulated *E. coli* Concentrations

Calibration Scenario

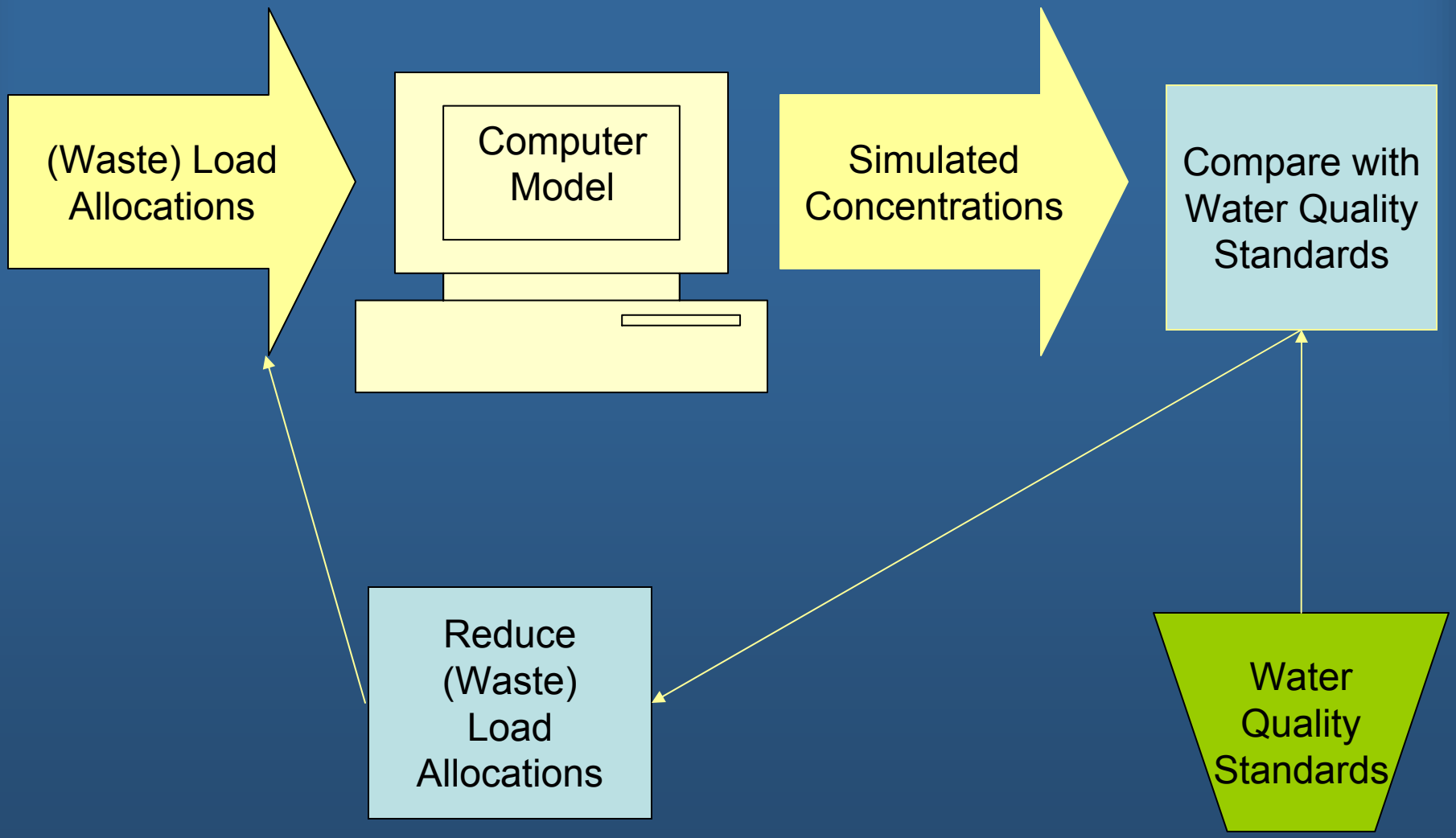


CE-QUAL-W2 Model of Four Mile Run



Step 4
Determine Required Reductions by Source

TMDL Scenarios



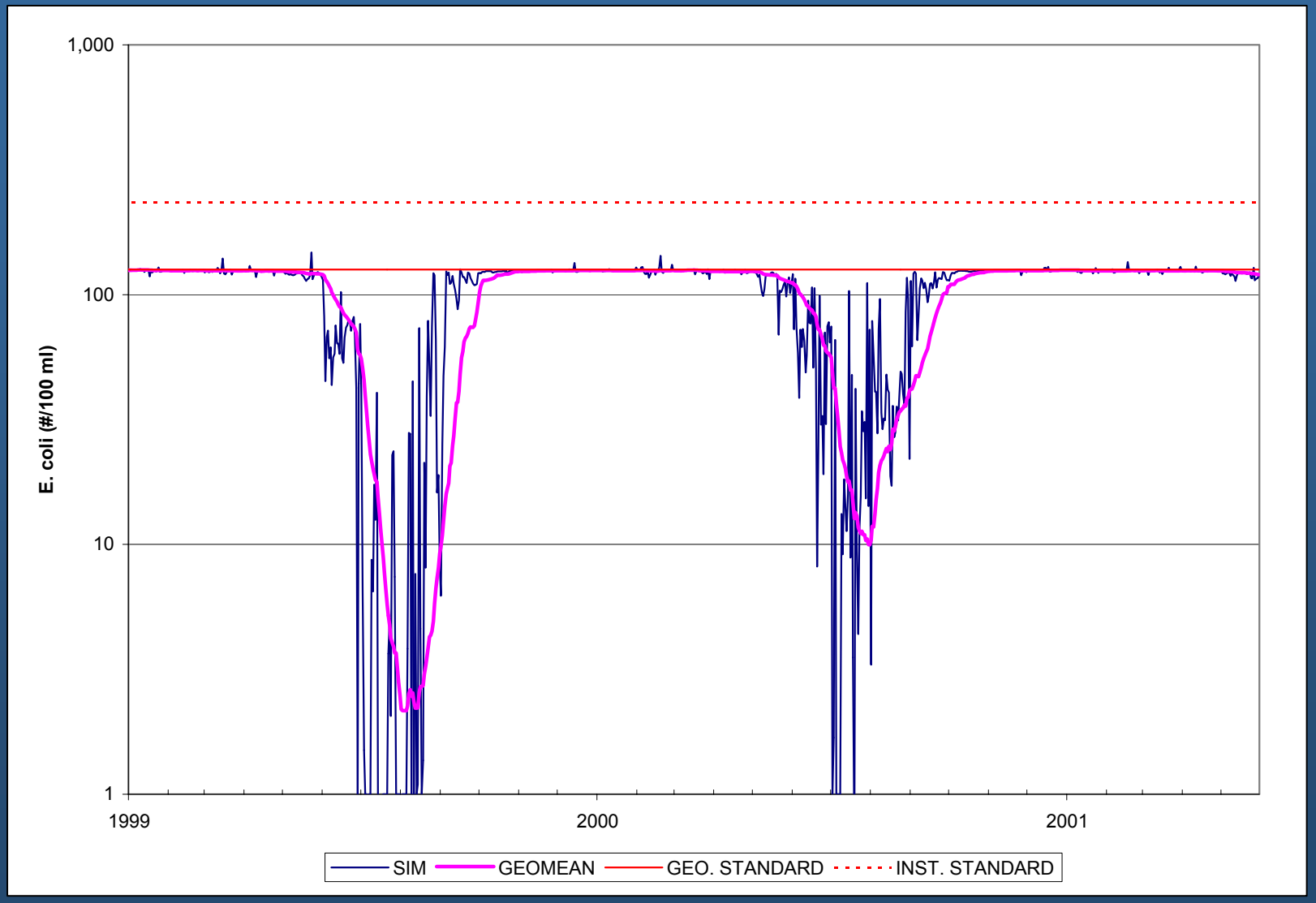
Tentative TMDL Scenario Assumptions

- DC Boundary Concentration at 126 #/100 ml (DC Geomean Standard)
- Upstream Boundary Concentration at 126 #/100 ml (VA Geomean Standard)
- Arlington WWTP at 126 #/100 ml (permitted concentration) and design flow (+ growth)

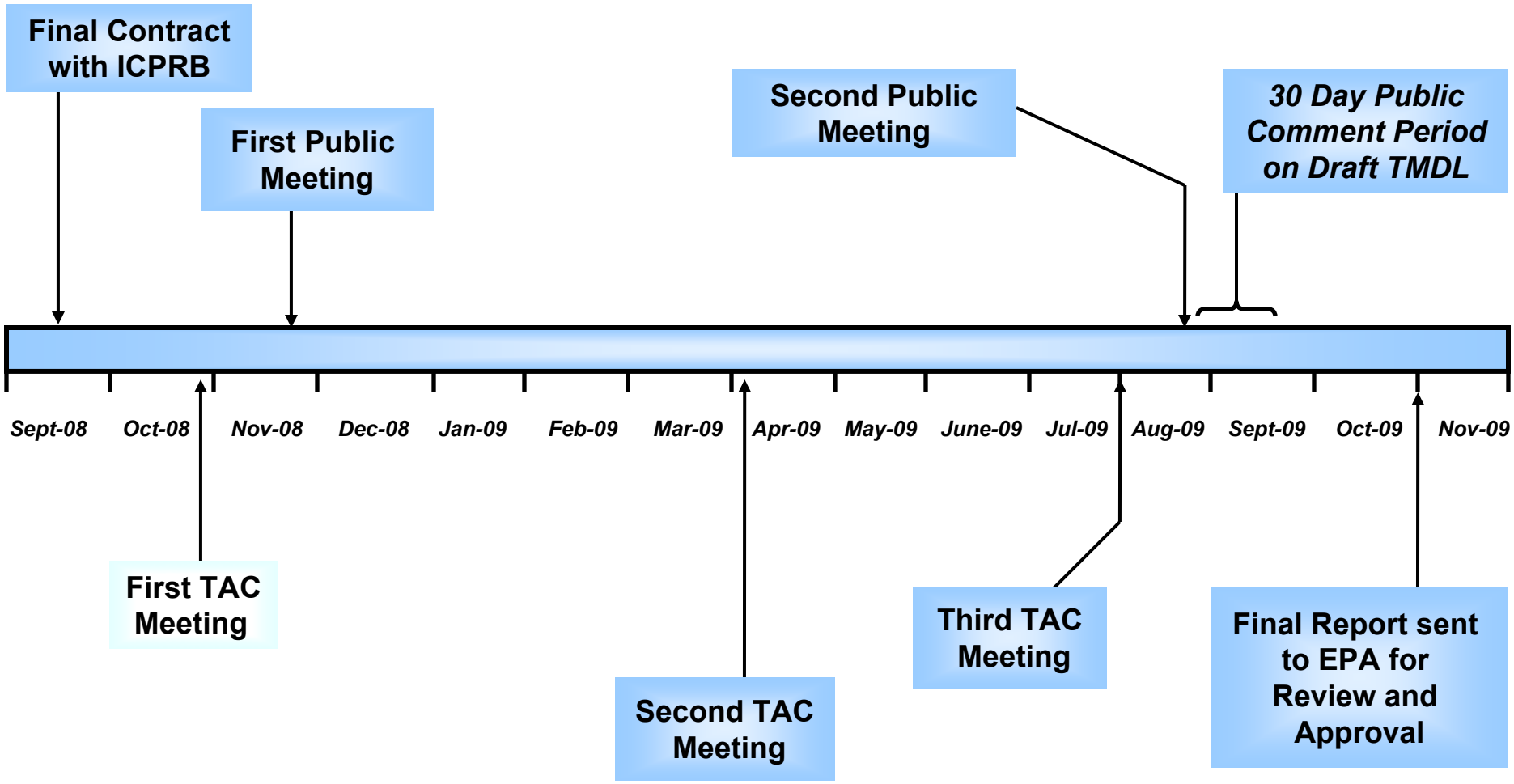
TMDL Objective

Determine WLA and LA for tidal drainage that enables tidal Four Mile Run to meet Water Quality Standards for E. Coli bacteria: 126 #/100 ml monthly geometric mean concentration and 235 #/ 100 ml instantaneous concentration

Simulated *E. coli* Concentrations TMDL Scenario



Tidal Four Mile Run Bacteria TMDL
Project Milestones



** Schedule subject to change.*

Comment Period

Comment Period for Materials Presented at the Public Meeting:

- **November 19, 2008 to December 19, 2008**
- **Comments should be submitted in writing to:**

Katie Conaway
mkconaway@deq.virginia.gov
13901 Crown Court, Woodbridge, VA 22193

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